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(54) Abstract Title
Method of establishing a communication link between a communication unit and base station

(57) A communication unit (e.g. mobile radio) stores in its memory a first set of base stations and a second set of base stations (and their corresponding control channels). To establish a communication link (or re-establish a failed link) the unit sequentially attempts to establish contact with base stations from the first set. At preset time intervals these attempts are interrupted in order to attempt to contact base stations in the second set. If no link is established during this interruption the unit returns to making attempts to contact base stations from the first set. The first set may comprise all base stations in the communication system. The second set may include base stations most recently used, or the last used base station together with its nearest neighbours. In a preliminary step the communication unit may attempt to contact base stations in the second set prior to the above method. The sets may be prioritised in many ways, for example according to a signal quality measurement, history of usage or location. The timing of interruptions may depend on the priority of each base station. More than two sets may be used with different interrupt times.

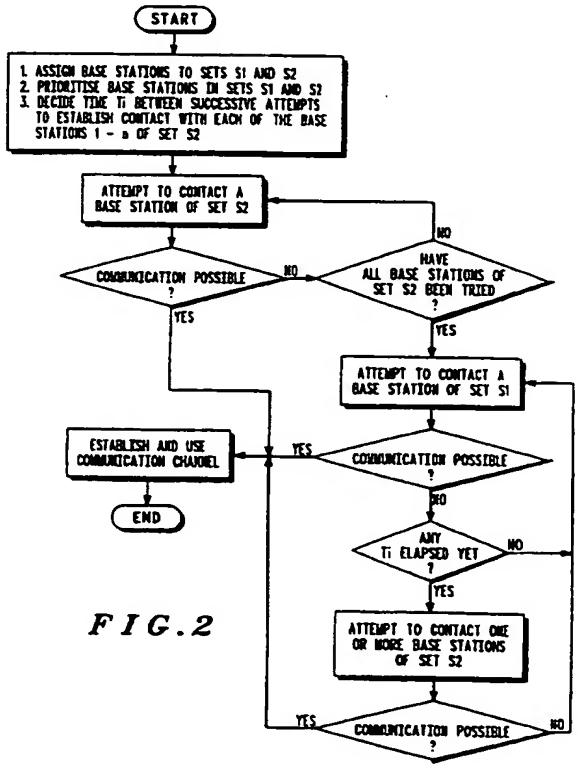

FIG.2

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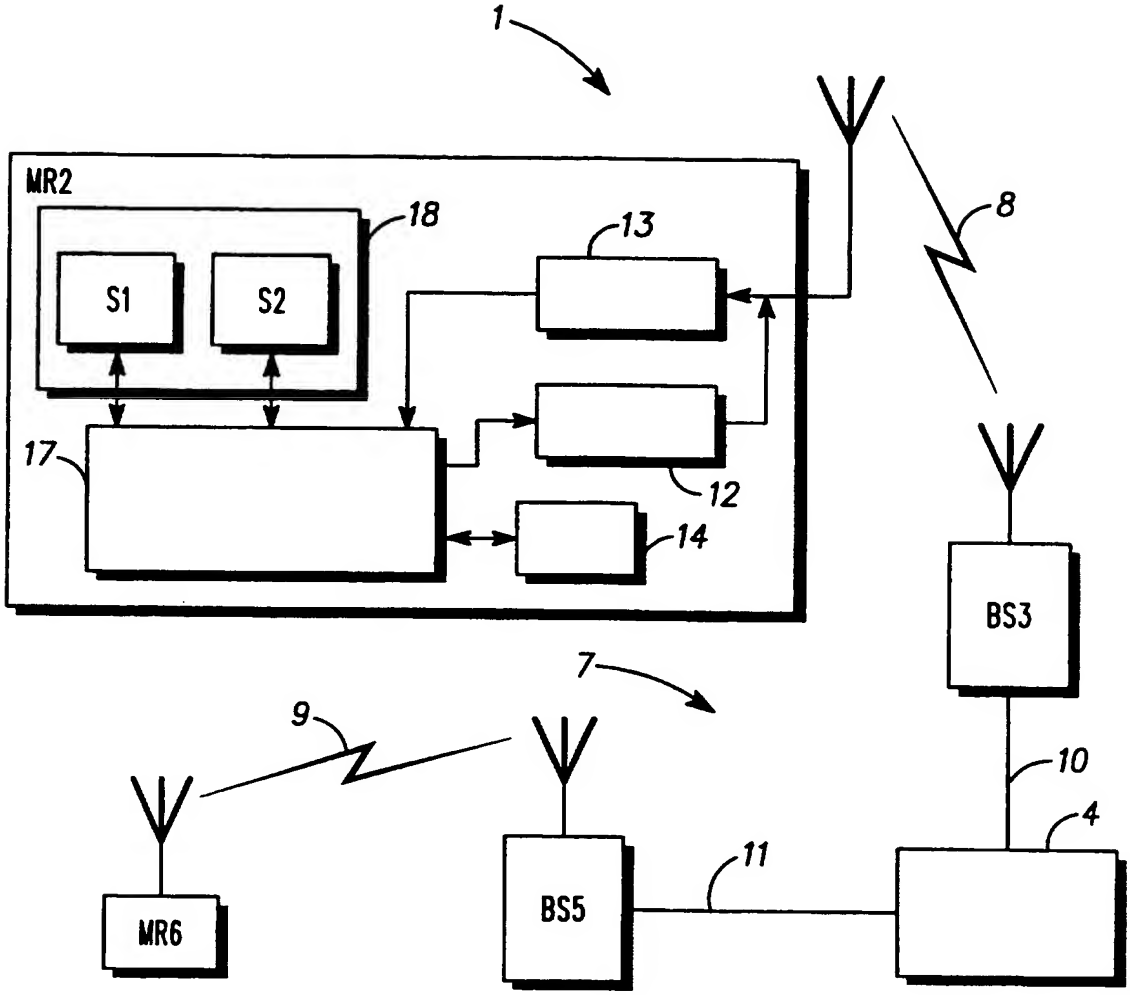

FIG.1

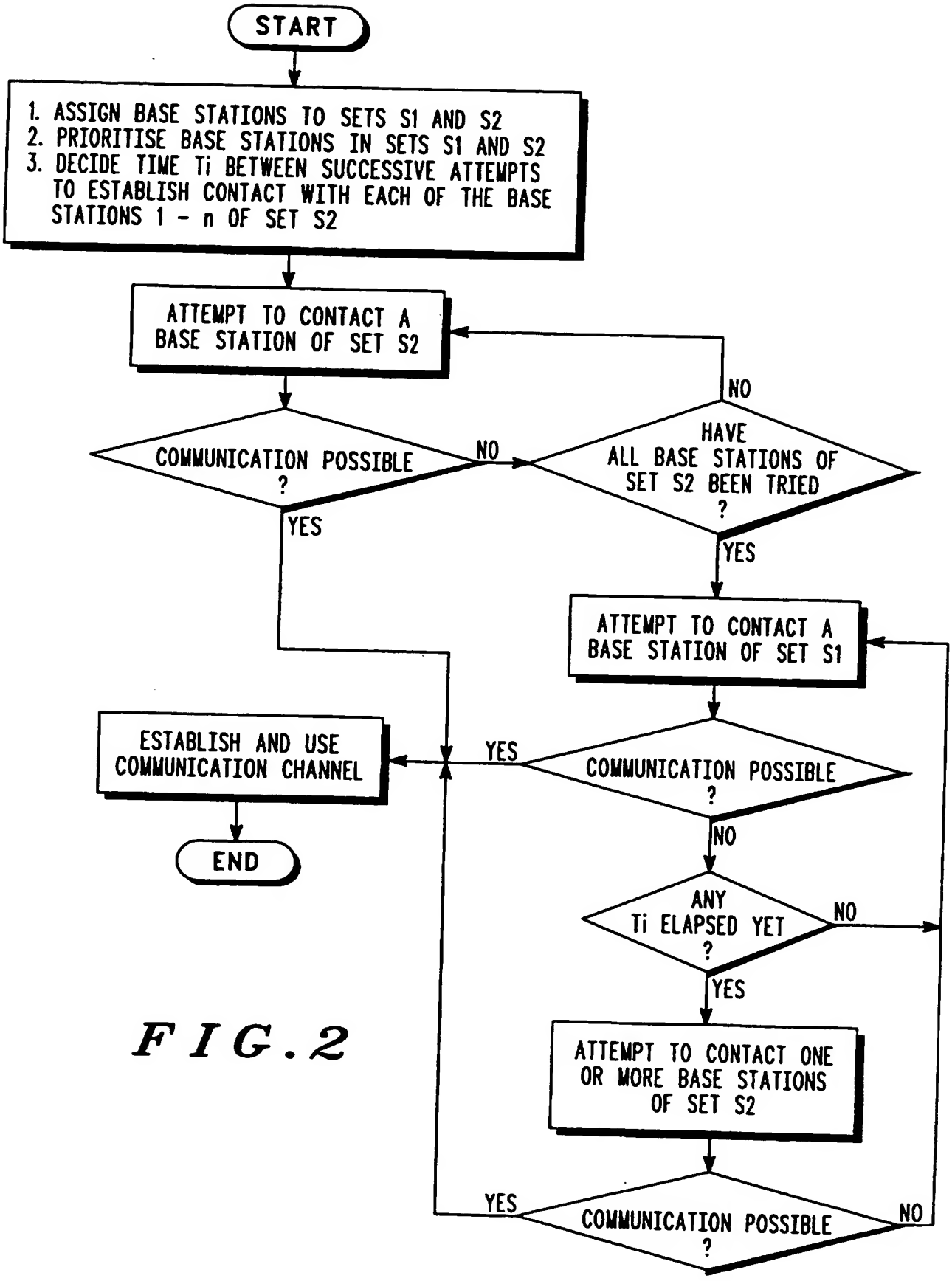

FIG. 2

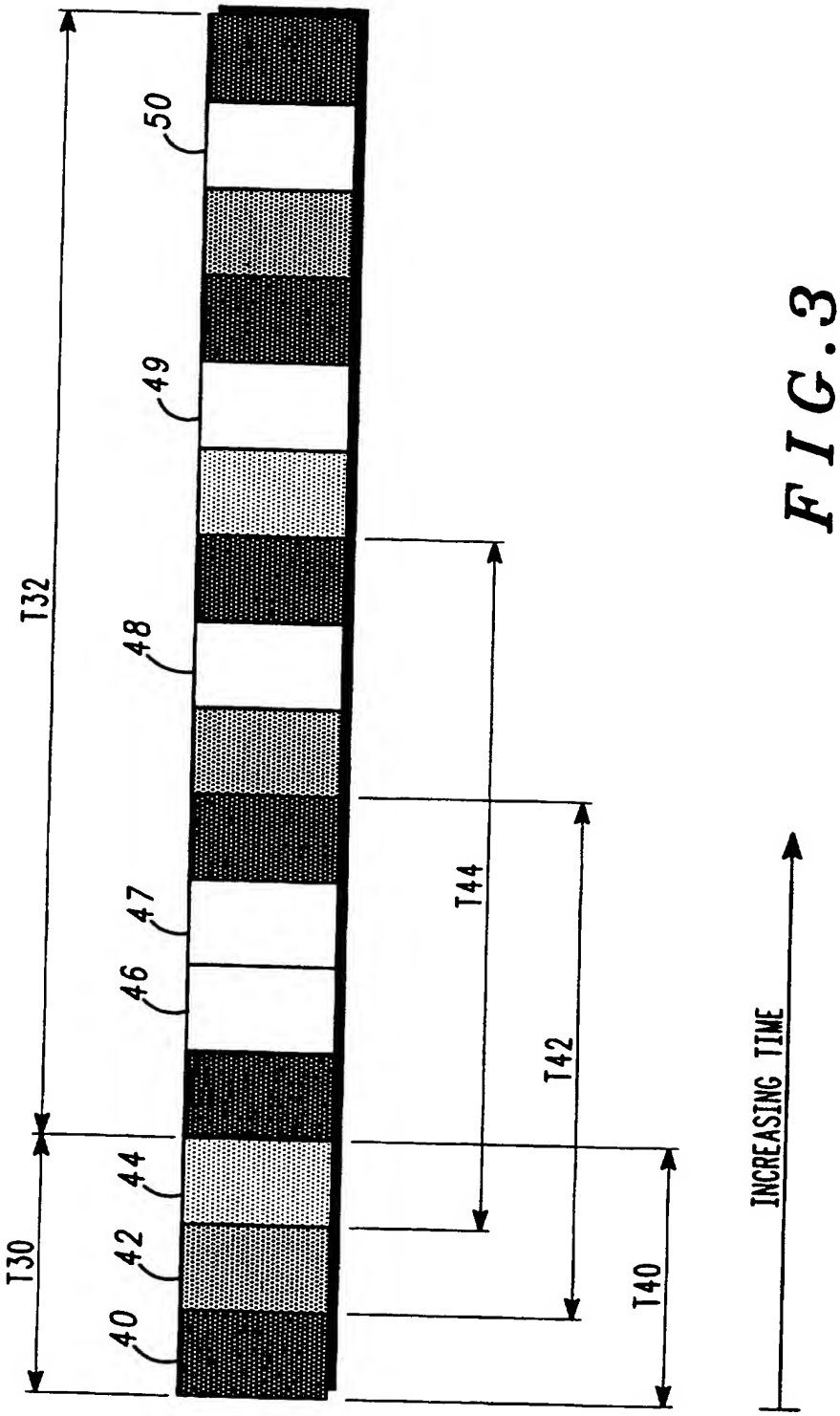

FIG.3

METHOD OF ESTABLISHING A COMMUNICATION LINK AND COMMUNICATION UNIT

Field of the Invention

This invention relates to a method of establishing a communication link between a communication unit and a base station. The invention is particularly applicable to, but not limited to, cellular communication systems.

Background of the Invention

In a radio communication system which includes base stations and communication units, each base station covers a specific geographical area and the communication units communicate with each other through the base stations. When a communication unit moves from a first coverage area to a second coverage area, the communication unit discontinues communication through a first base station in the first coverage area and establishes a new communication link through a second base station in the second coverage area. This process is called "roaming". The communication unit can be a handheld portable radio or a mobile radio.

There are known techniques associated with communication systems where a communication unit roams from a first base station to a second base station. In one of the methods the first base station transfers information about itself and its neighbouring base stations to the communication unit. The information includes several parameters such as base station address, signal quality, etc. The communication unit can then perform an operation termed "hand-off", which term designates the establishment of communication with a new base station when roaming. The communication unit will normally hand-off to the base station which provides the best signal quality.

However, the communication unit environment may change rapidly as the communication unit moves throughout the coverage area. Particularly, a communication link will fail due to the communication unit moving into a tunnel or underground parking area, or other such area lacking in coverage where the signal is blocked. Here the signal quality becomes unacceptable and

the communication link is broken. The communication unit will then need to operate a method of re-establishing the communication link as quickly as possible, in order to provide to the user the best possible grade of service.

Conventionally, these methods involve the communication unit first recognising that the communication link has failed and then attempting to locate an alternate base station. The communication unit may have a variety of information about the base stations of the system. It may have a partial or a complete list of the control channels used by the base stations of the network. In some systems, the communication unit may have a list of the base stations in cells which neighbour the base station with which it was last in communication.

Conventionally, the communication unit will scan sequentially the list or lists of base stations which it has, attempting to establish a communication link with each base station on each list in turn. Although it may start with the list containing the most recently used base station and its neighbours, it may well not be able to communicate with any of these and then have to work through the other lists. A list of the network channels may contain a significant number of frequencies. This is particularly the case where there are several valid networks allocating different frequency bands. Scanning through the channels on all the lists known to the communication unit until a communication link can be set up to a suitable base station may take a very considerable time.

An example of this for the TETRA system is as follows:
Scanning a single frequency on the communication unit's list may take up to 5 seconds. In a case where there are 32 control channels on the list there are therefore 32 frequencies to be scanned. Consider the case where the last channel on the list is the only one with which the communication unit is able to establish communication. The time to scan all 32 channels and establish a communication link to the last on the list would be 160 seconds, or more than 2.5 minutes. In large networks the number of frequencies may be even greater.

Consider now failure of a communication link between a communication unit and a base station during a call. The signal interruption may be long enough to indicate a link failure but yet still be short enough to restore the call if the communication unit can locate a base station as soon as one is reachable. If the call can be restored in this manner, there are clear

advantages for the user and the system, because they do not have to repeat the call set-up procedure. However, a time of 2.5 minutes to re-establishment as in the example given above would definitely result in the call being lost. Furthermore, for a considerable period of time the user would not be able to operate the communication unit. The short-comings of conventional methods are therefore clear.

This invention seeks to provide a method and an apparatus for establishing a communication link between a communication unit and a base station. Particularly, the method and apparatus concern re-establishing a communication link as quickly as possible when a communication link fails.

Summary of the Invention

The invention comprises a communication unit for communicating with a base station via a communication link. In accordance with the invention, the communication unit comprises:

a memory in which in use are stored first and second sets of base stations;

means for making attempts to establish a communication link to base stations of the first set;

means for making attempts to establish a communication link to base stations of the second set;

means for interrupting the operation of said means for making attempts to establish a communication link to base stations of the first set in order to make attempts to establish a communication link with at least one base station of the second set.

In a preferred embodiment of the invention, the means for making attempts to establish a communication link to base stations of the first and second sets are adapted to attempt to establish a communication link to each base station of the second set prior to further operation. The communication unit may be a radio device, preferably a mobile radio or a portable radio.

In use, the second set of base stations comprises either the base station with which the communication unit was most recently in contact or that base station and one or more of those base stations which neighbour it. The first set of base stations may comprise all available base stations with which the communication unit may possibly set up a communication link.

According to a further preferred embodiment, the communication unit comprises means for prioritising the base stations of the first and/or the second sets according to either a received or an anticipated signal quality parameter. The communication unit may be adapted to make the attempts to establish a communication link with at least one base station of the second set in the order of highest priority first and/or with a frequency dependent on base station priority.

Finally, the means for interrupting may comprise a programmable timer operably coupled to a microprocessor for programming a delay, for each base station of the second set, between successive attempts to establish a communication with that base station.

The invention also comprises a method of establishing a communication link between a communication unit and a base station, comprising making attempts to establish a communication link to base stations of a first set, interrupting the attempts to establish a communication link to base stations of the first set, and attempting to establish a communication link to at least one base station of a second set.

In a preferred embodiment, the method comprises, as a precursor, the step of attempting to establish a communication link to each base station of the second set.

In a further preferred embodiment, the method comprises the step of assigning to the second set of base stations the base station with which the communication unit was most recently in contact and/or one or more of those base stations which neighbour that base station. The base stations of the second set may be arranged into a prioritised sequence for making attempts to set up a communication link, the base stations being prioritised according to either a received or an anticipated signal quality parameter. The attempts to establish a communication link with one or more base stations of the second set may be made in the order of highest priority first and/or with a frequency dependent on the base station's priority. However, the base stations of the second set may all be assigned an equal priority for either or both the order and the frequency of attempts to establish a communication link.

The method may comprise the step of assigning to the first set of base stations all available base stations with which the communication unit may possibly set up a communication link.

The method according to the invention may be used to re-establish a communication link whenever the communication unit enters a zone with insufficient received signal strength and/or the said communication link fails.

The apparatus and method of the invention provide several advantages. These include:

(i) The re-establishment of a communication link as soon as possible following interruption of that link. This maximises the likelihood of continuous communication and/or minimum feasible interruption time to communications.

(ii) The possibility of working once through the second set of base stations in its entirety, before beginning the long process of trying all possible base stations in the first set.

(iii) An ordering of base stations according to a priority scheme. This allows a balanced approach to the order in which attempts are made to contact base stations from each of several sets. This approach is robust with respect to a wide variety of changes which might occur in the network. It allows attempts to be made to contact a variety of types of base station within a short time period, such that a base station is likely to be found whatever changes have occurred in the user's location or the network of available base stations since the sets were last updated.

This also allows the frequency of re-trying base stations of the second, 'most-likely', set to be changed easily.

(iv) The members of the sets of base stations can be updated and optimised frequently by the system itself, without requiring operator intervention. This applies also to the priorities assigned to the base stations of each set. The ways of selecting sets of base stations can also be amended with ease. Thus a mobile station could easily be re-programmed to assign to the second set, for example, those base stations with which it has most frequently been in contact, rather than those which neighbour the base station with which it was most recently in contact.

Further advantages will be apparent from the detailed description of the invention provided below.

Brief Description of the Drawings

FIG. 1 is a block diagram of a digital radio communication system and an enlarged view of a communication unit according to a preferred embodiment of the invention;

FIG. 2 is a flow chart showing a method for establishing a communication link in a radio communication system according to a preferred embodiment of the invention; and

FIG. 3 is a time diagram showing a sequence of attempts to establish a communication link with base stations of the first set and with base stations of the second set.

Detailed Description of the Drawings

Referring firstly to FIG. 1, a digital communications system is shown. The digital communication system 1 includes a plurality of communication units, for example a first mobile radio MR 2 and a second mobile radio MR 6. The digital communication system 1 further includes a first base station BS 3, a mobile switch centre 4, a second base station BS 5, and a communication link 7. The communication unit can be a radio device which is a mobile radio or a portable radio.

The communication link 7 includes a first communication link 8 from the first mobile radio MR 2 to the first base station BS 3, a second communication link 9 from the second base station BS 5 to the second mobile radio MR 6 and a wired communication channel. Communication links 8 and 9 may be digital mobile radio- or mobile telephone communication channels. The wired communication channel includes a connection 10 between the first base station BS 3 and the mobile switch centre 4 and a connection 11 from the mobile switch centre 4 to the second base station BS 5.

The first mobile radio MR 2 includes a transmitter 12, a receiver 13 and a memory 18. In use, a first set S1 and a second set S2 of base stations are stored in memory means 18. The first mobile radio MR 2 further includes means for determining a sequence of attempts to establish a communication link which includes a programmable timer 14, memory 18 and a microprocessor 17 for controlling the blocks of the mobile radio described

previously. These elements provide means for interrupting the attempts to contact base stations of the first set S1 in order to make an attempt to contact base stations from the second set of base stations S2.

Operation

The invention concerns the way in which the mobile radio attempts to establish a communication link with a base station.

When a mobile radio such as MR 2 needs to establish contact with a base station or to re-establish a communication link when one has failed, it has information available in memory about the base stations. This may include the frequency of the control channel used by each base station in the memory. The mobile radio MR 2 makes attempts to establish contact with these base stations, the attempts being made one base station at a time. If an attempt is successful, then the mobile radio MR 2 stays in communication over the communication link to that base station. If the attempt is unsuccessful, then the mobile radio MR 2 tries to establish contact with another base station from those in its memory 18.

In accordance with the invention, the attempts by a mobile radio to establish contact with a base station are made in a particular order. The mobile radio has available in memory 18 the sets S1 and S2 of base stations. The mobile radio attempts to establish a communication link with each base station of the first set S1. These attempts are made one at a time. However, the processor 17 and timer 14 can interrupt this sequence of attempts. At the time of an interruption, the mobile radio attempts to establish a communication link with one or more base stations of the second set S2. The timing and number of these interruptions and attempts to establish a communication link with one or more base stations of the second set S2 may be decided in a number of ways. Examples of these will be explained below. If no communication link was established during such an interruption, the mobile radio returns to making attempts to establish a communication link with base stations of the first set S1.

In order to more easily envisage this sequence of operation in accordance with the invention, examples of the types of base stations which make up each set of base stations S1 and S2 can be considered. The first set

S1 may, for example, include all the base stations of the communication system. Thus the first set S1 is a static set, including a permanent set of the base stations and their control channels. The first set S1 would only be changed on the occasions when there was a change in the group of base stations to which the mobile radio is permitted to have access, e.g. at the time of extending the network or dividing a cell. The second set S2, for example, may include the base stations which were most recently used by the mobile radio. Alternatively, the second set may consist of the base station with which the mobile radio was most recently in contact and the base stations which neighbour it. Thus the second set S2 is a dynamic set and may change its contents whenever mobile radio MR 2 roams from one coverage area to another coverage area.

The mobile radio unit has means for deciding which base stations should be included in each set held in memory 18, in accordance with the above definitions. These means are responsible for keeping the dynamic set S2 up to date. They may particularly receive and/or measure signal quality information from a base station with which the communication unit is in contact. They may also receive and/or measure information about base stations which neighbour the base station with which the communication unit is in contact. These functions can be performed by microprocessor 17 and receiver 13 in the embodiment shown in figure 1.

In a further development and preferred embodiment, the invention may comprise a preliminary step which is performed prior even to the first attempt to establish a communication link with a base station of the first set S1. This preliminary step involves the mobile radio attempting to establish a communication link with each base station of the second set S2. If it proves possible to establish a communication link with any of the base stations of the second set S2 during this preliminary step, then clearly the mobile radio does not need to make any further attempts. If this does not prove possible however, the mobile radio then proceeds with the above described attempts to establish a communication link with each base station of the first set S1, together with timed interruptions to try one or more base stations from the second set S2 once more.

Prioritisation of base stations.

The mobile radio unit prioritises its attempts to establish a communication link with base stations whose details are stored in memory 18. Illustrative ways of doing this are as follows:

(i) The base stations stored in the second set S2 may be prioritised according to a signal quality measurement. This may be a measurement performed by the communication unit during the period that it was last in contact with a base station. The signal quality information may also be derived from information sent to the communication unit from a base station.
Considering once more the arrangement shown in figure 1, when the mobile radio MR 2 is in contact with a base station and in receive mode, the receiver 13 receives information about the base stations. The microprocessor controller 17 can scan the control channels of the base stations and calculate their signal quality. Later attempts to establish a communication link with a base station may therefore be prioritised in order of highest quality of reception, or anticipated quality of reception, of the signals from the base stations.

(ii) Alternatively, the second set S2 may contain a particular preferred base station for immediately establishing a communication link. This preferred base station can be the base station with which the communication unit was last in contact. The set may then also contain base stations which neighbour the preferred base station. A lower prioritisation may be assigned to these latter base stations than to the preferred base station.
Although it is preferred that the base stations of the second set S2 are given different priorities, they may all be given the same priority.

(iii) The base stations stored in the first set S1 may be prioritised according to many different schemes. They may also not be prioritised at all.
Assume for example that set S1 contains all the base stations with which the radio unit is permitted to make contact in an entire country. The base stations could be prioritised according to the number of times that the mobile radio has communicated through the base stations in the past. Such history of usage data would be specific to that mobile radio. Alternatively, the priority might

depend on some feature of the base station itself, such as location within the country. Base stations along roads and railway lines and near airports might have the highest priority.

The base stations of the first set S1 may be placed in an ordered list on the basis of this prioritisation. Thus the base stations highest on the list would be tried first when working through the base stations of the first set S1. Furthermore, the radio unit could return one or more times to some of the base stations on the list before it had worked its way through all of the base stations of the whole list. This would raise the priority of some base stations of the first set S1, which would be tried more frequently than other base stations in the first set S1, without affecting the higher priority given to making attempts to establish a communication link with base stations of the second set S2 during interrupts.

Timing of interruptions to the attempts to establish communication with base stations of set S1.

Similarly to the decision over the prioritisation of base stations within each of the sets S1 and S2, the communication unit has control over the timing of interruptions to the sequence of attempts to establish a communication link with base stations in the first set S1. The communication unit needs to decide when these interruptions are to occur. One way of making this decision is as follows:

The radio unit can assign to each base station of the second set S2 a certain time period T, this being the time period between successive attempts by the mobile radio to establish communication with that base station. This time period would depend on the priority assigned to that particular base station of the second set S2. The base stations of highest priority should be tried most frequently. Therefore the higher the priority of the base station, the smaller the time period T assigned to it should be.

Example: Consider the effect of this on the arrangement shown in figure 1. Consider in particular a situation where mobile radio unit MR 2 has entered an area lacking in signal coverage, such as would happen if the radio unit were in a vehicle being driven through a tunnel. When the radio unit tries successively to

establish a communication link with base stations of the first set S1 held in its memory, it will interrupt this sequence of attempts in order to attempt to establish a communication link with base stations of the second set S2. The higher the priority of the base station of the second set S2, the higher the frequency of the interrupts to attempt to establish communication with that base station.

The instance of emergence from the tunnel is effectively a random event with respect to this timing scheme. On emergence from the tunnel then, the radio unit is statistically more likely to make an attempt to establish communication with a base station of higher priority, because these attempts are being made most often. An attempt to establish communication with a base station of higher priority is therefore likely to be made sooner after emergence from the tunnel than an attempt to establish communication with a base station of lower priority. Thus the timing scheme described for the interruptions helps to minimise the likely delay in establishing a usable communication link to a base station, as soon as communication would once more be possible.

Clearly, if the base stations of the second set S2 all had the same priority, the radio unit would assign the same time period T to each. Attempts to establish a communication link with all these base stations would therefore occur with the same frequency. These attempts could all be made together during one interruption of the attempts to establish a communication link with base stations of the first set S1, or during different interruptions.

Multiple sets of base stations

The memory 18 of the mobile radio MR 2 has been described as maintaining information about two sets of base stations, S1 and S2. However, the base stations known to the mobile radio may be divided up into more than two sets. Each set can have a different priority relative to the other sets. Similar principles of prioritisation and frequency of interrupts to those explained above for sets S1 and S2 would be applied within the various sets of base stations and amongst the sets. The relative importance of each base station to the mobile radio user and/or the desired statistical likelihood of

making an early connection to each base station could determine the set in which the base station should be included and/or its prioritisation within the set.

Returning to the arrangement of figure 1, consider the mobile radio MR 2 conducting a call to mobile radio MR 6 via a base station, such as base station BS 3. If the communication link 7 to base station BS3 were suddenly to fail, due to the mobile radio MR 2 entering a tunnel or an elevator, MR 2 would attempt to re-establish a communication link to a base station of the network. Preferably, mobile radio MR 2 first starts a sequence of attempts to establish a communication link 7 with each base station of the second set S2. The base stations in set S2 would be base station BS 3 and the base stations which neighbour it. If radio unit MR2 fails to establish a communication link 7 with base stations of the second set S2, then a sequence of attempts to establish a communication link with base stations of the first set S1 will be performed. Periodically during this sequence of attempts to establish a communication link with base stations of the first set S1, the mobile radio MR 2 will interrupt the sequence and attempt to establish a communication link with one or more of the base stations of the second set S2. Typically, such interruptions would occur most frequently in order to make an attempt to establish a communication link with the base station BS3 with which MR 2 was most recently communicating. Such interruptions would occur less frequently for the purpose of making attempts to establish a communication link with those base stations of set S2 which merely neighbour BS3.

Figure 2

One method of scanning base stations in accordance with the invention is shown in detail in figure 2. Referring to figure 2, a flow chart of a method for establishing a communication link is shown. Notably:

(i) The method shown in figure 2 includes the preferred step of making one attempt to contact each base station of the second set S2, before any attempts are made to contact base stations of the first set S1.

(ii) The base stations of the second set S2 could be the most recently used base stations. Furthermore, these base stations can be prioritised by an attribute which is a combination of the communication system parameters or by a received signal quality parameter. The order of performing the attempts will be set accordingly.

(iii) Although not stated on the figure, the step of setting a time period Ti for successive attempts to contact the same base station of set S2 is measured out by timer 14 of figure 1.

As examples of these time periods, an attempt to establish a communication link with the first base station BS of the second set S2 will be performed every 5 seconds, and with the second base station of the second set S2 every 10 seconds. The periods Ti could be, for example, be inversely proportional to the priority assigned to the particular base station BSi concerned. More detailed explanation about the sequence of attempts will be described later with reference to figure 3. An alternative would be to set an equal priority to each base station of the second set S2. In this case the suitable time delay between successive attempts to contact the same base station would be the same for all the base stations of set S2.

(iv) It should be noted that various alternative steps are not shown in the flow chart. For instance, the step of attempting to contact each base station of the second set S2 could be carried out before assigning priorities to base stations of the first set S1.

The overall effect of the method of the invention is to establish a communication link with the first available base station. The time to find this base station is minimised and may be substantially reduced with respect to conventional methods.

Figure 3

Referring now to figure 3, a time diagram of a sequence of attempts to establish a communication link with base stations of the first set S1 and with base stations of the second set S2 is shown. Each marked block in figure 3

denotes the time required by the mobile radio unit to make an attempt to establish communication with one of the base stations. The second set S2 includes the base stations 40,42 and 44 and the first set S1 includes the base stations 46,47,48,49 and 50.

The time diagram also shows time delays T40,T42 and T44 between successive attempts to establish a communication link with the same base station of the second set S2. Also shown is time period T32 for making attempts to establish a communication link with base stations of the first set S1. Within time period T32 interruptions occur. At the time of each interruption, an attempt is made to establish a communication link with one of the base stations 40,42 or 44 of the second set.

Starting from the left of the figure, the period marked T30 indicates a time where attempts are made to establish a communication link successively with each of the three base stations 40,42 and 44 of the second set S2. The first three differently shaded blocks starting from the left of the figure indicate these attempts. Base station 40 of the second set S2 is the base station with the highest priority. Therefore an attempt is made to establish a communication link with this base station first. Base stations 42 and 44 are of successively lower priority, and these are therefore the second and third base stations to which an attempt is made.

The mobile radio has failed to establish a communication link with any base station during the initial attempts to contact base stations 40,42 and 44. Therefore during the subsequent time period T32 the mobile radio attempts to contact base stations of the first set S1. Time period T32 may greatly exceed T30.

Interrupts are made during time period T32 in order to attempt to establish communication with base stations 40,42 and 44. The timer 14 of figure 1 controls the timing of these interrupts. Each interrupt occurs when the time T40, T42 or T44 has elapsed since the previous attempt to contact base stations 40, 42 and 44 respectively. These interrupts and attempts are shown as blocks during time period T32 on figure 3 which have the same shading as the blocks marked 40, 42 and 44 shown in the time period T30. The remaining white blocks in time period T32 marked 46,47,48,49 and 50 indicate attempts to establish communication with base stations of the first set S1.

As illustrated in figure 3, the invention may result in several attempts being made to establish a communication link with a particular base station of the second set S2 before elapse of time period T32. See for example the multiple appearances of the most darkly shaded block on the figure, marked as 40 at its first occurrence. This however corresponds fully with the aims of the invention, whereby the mobile radio seeks to make the most frequent attempts to make contact with base stations which are most likely to be accessible to it. Nevertheless, the mobile radio, progressing through time period T32, will also make at least one attempt to contact every base station to which it is permitted access.

An alternative method for establishing a communication link could be used when a communication unit memory 18 includes more than two sets of base stations. The communication unit, for example, may include a first set of base stations which includes the most recently used base station and its neighbouring base stations. The communication unit includes a second set of base stations which includes a set of regional base stations. A third set may include a set of service base stations and a set of all available base stations of the entire network. A predefined priority and a predefined sequence of attempts to establish a communication link will be assigned to each base station of each set. Attempts to establish a communication link with members of each set of base stations will be done periodically.

The method described above is particularly useful for re-establishing a communication link when a mobile radio enters a zone with poor signal reception, such as a tunnel or an elevator, and the communication link suddenly fails. The improvement to the performance of a mobile communication unit in accordance with the invention is particularly apparent in any situation when a strong signal is totally blocked for a short period of time.

Claims

1. A method of establishing a communication link (8) between a communication unit (MR) and a base station (BS), comprising:
making attempts to establish a communication link to base stations of a first set (S1);
interrupting the attempts to establish a communication link to base stations of the first set (S1); and
attempting to establish a communication link to at least one base station of a second set (S2).

2. The method of claim 1 comprising, as a precursor, the step of attempting to establish a communication link (8) to each base station of the second set (S2).

3. The method of claim 1 or claim 2 comprising the step of assigning to the second set of base stations (S2):
the base station with which the communication unit (MR) was most recently in contact.

4. The method of any previous claim comprising the step of assigning to the second set of base stations (S2):
one or more of those base stations which neighbour the base station with which the communication unit (MR) was most recently in contact.

5. The method of any previous claim comprising the step of assigning to the first set of base stations (S1):
all available base stations with which the communication unit (MR) may possibly set up a communication link (8).

6. The method of any previous claim comprising the step of arranging the base stations of the second set (S2) or of both the first (S1) and second (S2) sets into a prioritised sequence for making attempts to set up a communication link (8), the base stations being prioritised according to either a received or an anticipated signal quality parameter.

7. The method of claim 6 comprising the step of making the attempts to establish a communication link (8) with at least one base station of the second set (S2) in the order of highest priority first.

8. The method of claim 6 or claim 7 comprising the step of making the attempts to establish a communication link (8) with at least one base station of the second set (S2) with a frequency dependent on that base station's priority.

9. The method of any of claims 1-5 comprising the step of assigning to each of the base stations of the second set (S2) an equal priority for either or both the order and the frequency of attempts to establish a communication link (8).

10. Use of the method according to any previous claim to re-establish a communication link whenever the communication unit (MR) enters a zone with insufficient received signal strength and/or the said communication link fails.

11. A communication unit (MR) for communicating with a base station (BS) via a communication link (8), the communication unit comprising:
a memory in which in use are stored first (S1) and second (S2) sets of base stations;
means for making attempts to establish a communication link to base stations of the first set (S1);
means for making attempts to establish a communication link to base stations of the second set (S2);
means for interrupting the operation of said means for making attempts to establish a communication link to base stations of the first set (S1) in order to make attempts to establish a communication link with at least one base station of the second set (S2).

12. The communication unit (MR) of claim 11 whereby the means for making attempts to establish a communication link (8) to base stations of the first (S1) and second (S2) sets are adapted to attempt to establish a communication link to each base station of the second set (S2) prior to further

operation.

13. The communication unit (MR) of claim 11 or claim 12 whereby, in use: the second set of base stations (S2) comprises either the base station with which the communication unit was most recently in contact; or the base station with which the communication unit was most recently in contact and one or more of those base stations which neighbour that base station.

14. The communication unit (MR) of any of claims 11-13 whereby, in use: the first set of base stations (S1) comprises all available base stations with which the communication unit may possibly set up a communication link.

15. The communication unit (MR) of any of claims 11-14 comprising means for prioritising the base stations of the second set (S2) or of both the first (S1) and second (S2) sets according to either a received or an anticipated signal quality parameter.

16. The communication unit (MR) of claim 15 whereby the unit is adapted to make the attempts to establish a communication link with at least one base station of the second set (S2) in the order of highest priority first and/or with a frequency dependent on base station priority.

17. The communication unit (MR) of any of claims 11-16, whereby the means for interrupting comprises a programmable timer operably coupled to a microprocessor for programming a delay, for each base station of the second set (S2), between successive attempts to establish a communication with that base station.

18. The arrangement of any previous claim wherein the communication unit (MR) is a radio device, preferably a mobile radio or a portable radio.

19. A communication unit (MR) substantially as hereinbefore described with reference to, and/or as illustrated by, the drawings.

The Patent Office

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Claims searched: All

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Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

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Other: Online Database: WPI

Documents considered to be relevant:

Category	Identity of document and relevant passage	Relevant to claims
X	US5020093 (PIREH) see col.5 lines 16 - 44	1, 11

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.